# INSTRUCTION MANUAL
# STABILIZED D. C. AMPLIFIER

## MODEL 62A

QC CALIBRATION
PROCEDURES
GROUP COPY

ELECTRO-MECHANICAL RESEARCH, INC.

RIDGEFIELD, CONN.

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SECTION I

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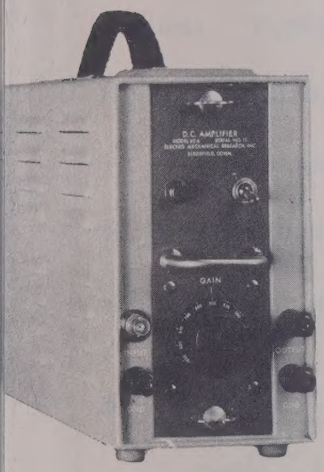
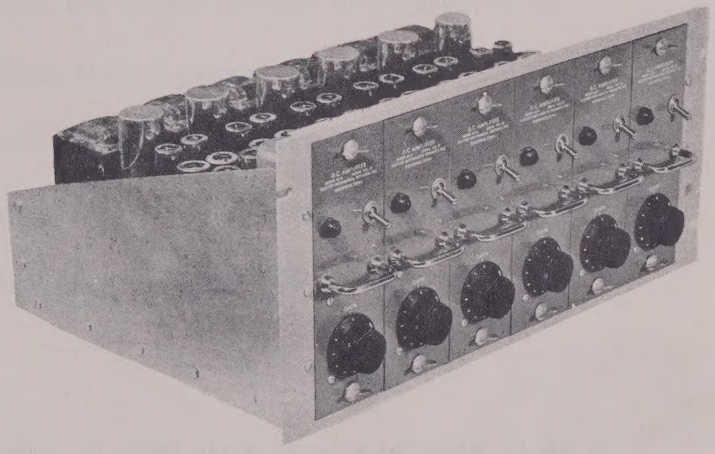
# STABILIZED D.C. AMPLIFIER
## MODEL 62




MODEL 62 AMPLIFIER
IN LABORATORY HOUSING



SIX MODEL 62 AMPLIFIERS
IN RACK ADAPTER

The Model 62 Amplifier is a stabilized amplifier having a pass band from DC to 25 Kc and a gain of 1000. Zero drift is restricted to 20 microvolts equivalent input over any period of operating time. It is designed for general laboratory use and for multi-channel instrumentation applications when input signals in the millivolt range must be amplified without zero drift errors. Typical applications are the amplification of outputs from thermocouples, DC excited strain gages, and other transducers capable of converting heat or stress input variations to electrical output signals.

The basic amplifier includes a complete built-in power supply and external connector. Accessories include laboratory housings which provide front panel input and output connections, and rack adapters which permit as many as six amplifiers to be accommodated in 8-3/4 inches of panel space in a standard 19-inch relay rack.

G62408

# SECTION III

## DESCRIPTION AND INSTALLATION

### 1. General

The Model 62A D. C. Amplifier is a general purpose instrument with a pass band from DC to 25 Kc and a gain of 1000. It is intended for general laboratory use and for multi-channel instrumentation applications. Typical applications are the amplification of outputs from thermocouples, and D. C. excited strain gages.

The basic amplifier includes a built-in power supply. Accessories include a laboratory case for single units, and a rack adapter for six amplifiers in a panel 8-3/4" high on a standard 19" relay rack.

### 2. Characteristics

Gain: 1000 ±1% maximum. A step attenuator provides gains of 500, 200, 100, 50, 20, 10, 5, 2, 1, and 0. ±3% -25%

Input: 200,000 ohms impedance. Shielded cable is required.

Output Range: For load impedance greater than 1000 ohms, 0 to ±5 volts. For load impedances less than 1000 ohms, 0 to ±5 ma.

Stability: Output zero offset is less than ±20 millivolts with a 115-volt line supply. An A. C. line voltage variation of ±10 volts results in an additional offset of ±25 millivolts at the output. A five minute warmup is required.

Chopper Intermodulation: Less than 2% of actual signal level. Intermodulation occurs only in the vicinity of 60 cps and its harmonics.

Noise: Less than 15 microvolts equivalent input as read on an averaging type vacuum tube voltmeter.

Linearity: ±0.25% of full scale.

Frequency Response: Flat within ±2% from D.C. to 10 Kc.

Dimensions: Basic Amplifier 2-3/4" W x 8" H x 12-1/4" D.

Laboratory Housing 4-3/4" W x 8-1/2" H x 14-1/2"D.

Rack Adapter 8-3/4" H x 14-1/2 D.

Controls: Power Switch

Calibrated Step Attenuator

3. Installation

The amplifier unit plugs into either the laboratory housing or the rack adapter. The unit is fastened in place by rotating the fasteners at top and bottom of the panel a quarter turn. If the amplifier is to be operated out of the housing or rack adapter, it is important that all connections noted on the schematic be made. Several jumper connections on the mating plug are required for normal operation of the unit. These jumpers are provided to make possible the attachment of a variety of accessories to the basic amplifier. When the amplifier is furnished without the laboratory cabinet or rack adapter, a Cannon plug, type number DPB-A10C2-33S-1L (EMR modified), must be used. This connector must be modified by inserting an insulating washer to prevent contact of the coaxial connector outer conductor with the frame of the connector. This modified connector is not normally furnished, except with laboratory cabinet or rack adapter.

## 4. Accessories

The following accessories are intended for use with the Model 62A Amplifier:

1. Model LA-62 laboratory cabinet
2. Model RA-62 rack adapter
3. Cannon Receptacle, number DPB-A10C2-33S-1L (EMR modified)
4. Model 74A output amplifier (for pen motors)
5. Model 85A output amplifier for driving low impedance galvanometers.

# SECTION IV

## AMPLIFIER OPERATING PROCEDURE

### 1. General

The amplifier can be operated in either the laboratory housing or the six channel rack adapter. When installed in either housing, a number of pins on the mating connector are connected together as shown on the schematic diagram. These pins are provided to permit the use of a number of accessory units; if the amplifier is to be operated outside of the case, it is important that these connections be made before attempting operation. The required connections are as follows:

| | |
|---|---|
| Pins 1 and 2 | 115 VAC 60 cps power |
| Pins 3 and 5 | Jumpered together |
| Pin 4 | Coaxial output |
| Pin 6 | Coaxial input |
| Pin 7 | Ground |
| Pins 8, 9, and 10 | Jumpered together |

### 2. Input and Output Connections

A shielded lead should be used in the amplifier input connector. The amplifier input and output connections must be made in such a way that no direct external connection between the input and output grounds results. A connection between input and output grounds forms a ground

loop which couples a portion of the power transformer stray field into the input circuit and results in excessive noise. In the laboratory housing the outside portion of the input coaxial connector is insulated from the housing frame; the output ground is connected to the unit case directly. If shielded wire without an outside insulating sheath is used, it should not be allowed to touch the case.

The output load is connected to the coaxial pin 4 of the plug. When the laboratory housing is used, the two binding posts at the right of the front panel supply the output.

3. Gain Control

The gain may be adjusted with the gain control of the front panel. For the gain setting of 1000 the gain is set at 1000, ±1% at the factory. For other gain settings the gain accuracy is within ±3% since the initial gain setting error may be superimposed on two 1% errors in the attenuator resistors.

Overload limiting of the amplifier will occur at outputs greater than 5 volts and less than 20 volts as a function of load impedance and line voltage. Limiting is not necessarily symmetrical for positive and negative inputs.

4. Power Source

The amplifier will operate from a 105-volt to 125-volt line and is unaffected by ±10% variations in line frequency. In some instances transient changes in the line voltage may produce a substantial zero error.

5. Power Switch

The power switch on the front panel may be operated after the unit is mounted in the mating plug. The pilot light on the front panel indicates line continuity.

6. Fuse

The fuse used is a 3AG 1 Amp. 250 V and is located on top of the amplifier chassis. The unit must be removed from the case to permit fuse replacement.

# SECTION V

# THEORY OF AMPLIFIER OPERATION

## 1. General

The Model 62A amplifier consists of a chopper type D. C. amplifier, a conventional resistance capacitance coupled amplifier, a 4 cps R-C crossover network, and a cathode-follower output stage. Negative feedback is provided from the output to the low-pass chopper amplifier, and to the high-pass amplifier. A simple power supply with gas tube regulation for the B supply is provided. A D.C. heater supply is used for the two input stages to make a low noise level possible.

## 2. Chopper Low-Pass Amplifier

The chopper low-pass amplifier consists of a special Brown chopper, tubes V-1, and V-2, and a diode demodulator made up of selenium diodes D-1 and D-2.

Any D.C. voltage difference between the end of R-23 to which the chopper reed is connected and the output of the step attenuator R-1 results in a 60 cps signal applied through C-8 to the grid of V-1. This signal is amplified by V-1 and the two stages of V-2 and then demodulated by the diode switch made up of D-1 and D-2 to result in a half wave rectified voltage applied to R-37. The polarity of this voltage depends upon the polarity of the difference voltage across the input chopper since chopper and demodulator operate in synchronism. The D.C. output of this ampli-

fier is applied to the grid of the output cathode-follower (V-4) through resistors R-37 and R-13. A portion (nearly 0.001) of the cathode-follower output appears across R-23 as feedback to determine the low frequency gain of the amplifier. The feedback ratio is adjusted at the factory by choosing the value of R-20 to obtain a gain of 1000 ±1%.

3. High-Pass Amplifier

The high-pass amplifier consists of tube V-3, and the pentode section of V-4. Any A.C. voltage that appears between R-4 and the input grid of V-3 is amplified by the two sections of V-3 in cascode, and then by the pentode section of V-4. The output of this amplifier is mixed with the output of the low-pass amplifier at the triode grid of V-4. Components C-6 and R-13 form a crossover network to separate the spectra of the two amplifiers. A portion of the output of the cathode follower (0.001) is applied to the input cathode of V-3 by resistors R-15 and R-4; resistor R-16 is used to adjust the overall A.C. gain to 1000, ±1%.

4. Overall Operation

The combination of the two amplifiers previously described results in a combined characteristic flat from D.C. to 10 Kc. The ripple introduced by the chopper amplifier into the output stage appears as noise within the pass band of the high-pass amplifier injected into its output stage. The feedback in the high-pass amplifier tends to reduce this

ripple by an amount equal to the loop gain (30-40 db). For this reason an examination of the waveform of the last stage of high-pass amplifier will show a substantial 60 cps signal to be present.

When signals containing components which are nearly harmonically related to the chopper frequency are applied to the amplifier, any portion of this signal which appears across the chopper will result in difference-frequency components in the output. A third feedback network made up of R-19, R-18, and R-25 is used to permit adjustment of the amplifier to minimize beats. The function of this divider is to minimize the high frequency difference voltage between the cathode and grid of V-1. This adjustment is made by choosing a value for R-20 which minimizes "beats" in the output.

5. Power Supplies

The amplifier as previously described is direct coupled only at the output level. Hence the need for highly stabilized supplies is eliminated. An OA2 regulator tube is used for controlling the positive supply. The drop across the OA2 dropping resistor R-43 is used as a negative supply to permit negative excursions of the output cathode follower.

D.C. excitation is used for the heaters of the input tubes V-1 and V-3. This arrangement results in a substantially lower noise level than could be achieved otherwise.

Four 1N91 germanium diodes are used as a full wave rectifier for this supply. An R-C filter minimizes ripple at the input heaters.

## SECTION VI

## AMPLIFIER ADJUSTMENTS

### 1. Adjustments

Long time changes in the values of the precision deposited carbon resistors used in the feedback circuits may necessitate some readjustment of the amplifier. The following procedure may be used for these adjustments:

#### a. A. C. Gain

The gain adjustments should be based upon a standard reference divider or attenuator with a ratio of 1000:1. If a 100 cps signal of about 3 volts rms is applied to the input through the reference divider, an oscilloscope connected between the output terminal and the high level input to the divider will display any error voltage due to improper gain. The gain may be readjusted by changing R-16. The proper value of R-16 can be determined by substituting a decade resistance box for the resistor and adjusting for an oscilloscope null. A half watt carbon resistor of the RMA 10% series having a value closest to the optimum thus determined can be used for R-16 without significant gain error.

#### b. D.C. Gain Adjustment

D.C. gain adjustments are made in much the same way as A.C. gain adjustments. A D.C. source of approximately 5 volts is

used to supply the reference divider, and the difference between output and input can be sensed with a microammeter and multiplier resistor chosen so that a 50 millivolt differential is readily detected. The reading of the microammeter should be noted with zero input volts applied to the divider. When 5 volts is applied, the value of R-20 should be adjusted to the same value. A half watt carbon resistor of the 10% RMA series can be used for R-20.

c. Zero Adjustment

A zero offset outside of the permissible value can be readjusted by substituting a decade resistance box for R-39 and adjusting for zero output with the nominal line voltage usually used with the instrument. A 1% deposited carbon resistor of a value within 1000 ohms of the optimum value should be used if a zero setting within the specifications is to be achieved.

# SECTION VII

# AMPLIFIER MAINTENANCE

## 1. General

Before undertaking maintenance of the amplifier, some care should be taken to make certain that the measurement technique employed is satisfactory. Because of the low level measurements made possible by this equipment, some extra precautions are necessary. If an excessive zero offset is experienced, this should be rechecked with the amplifier input isolated from the measured circuit. Voltage drops in seemingly adequate conductors, thermoelectric potentials, and electrochemical potentials can all produce substantial errors in attempted measurements.

It is not recommended that the amplifier be turned on without either of the two input tubes V-1, and V-3. Removal of either of these tubes may apply an excessive heater voltage to the remaining tube and to the electrolytic filter capacitors C-16, and C-17.

## 2. Low-Pass Amplifier Defects

A zero offset in excess of amplifier specifications usually indicates a low value of loop gain in the low pass amplifier. The low pass amplifier gain can be measured by shorting the amplifier output and measuring D. C. gain from input at full gain to the junction of R-38 and R-39. The voltage at this junction should be measured with a high impedance D. C. vacuum tube voltmeter (10 megohms or greater). The measured D. C. gain should be greater than 40,000 when measured with inputs less than

100 microvolts. If the gain is low tubes V-1 and V-2 may require replacement.

Small offsets outside the specifications may result from large changes in the characteristics of the output tube. This can be corrected by replacing the tube with a new selected output tube of by shunting R-38 or R-39 with a fixed carbon resistor.

Complete failure of the low-pass amplifier will result in a low frequency oscillation, (0.2 to 1.0 cps) since the phase characteristic of the high-pass amplifier alone will not accommodate the amount of feedback used.

3. High-Pass Amplifier Defects

A larger than normal 60 cps noise component may result from low high-pass amplifier gain since chopper ripple reduction depends upon the loop gain. Poor high frequency response will also be apparent in this case. The high-pass amplifier gain can be measured by unpluging P-2, shorting pin 3 of V-3 to ground, shorting the junction of R-38 and R-39 to ground, and then measuring A.C. gain from input to output. At 1 Kc a gain of at least 40,000 should be present when measured with inputs of 100 microvolts or less.

4. Power Supply Defects

Excessive amplifier noise at harmonics of 60 cps may result from poor filtering of input stage heater supplies. The voltage appearing at the junction of R-40 and C-17 should have less than 1 volt peak-to-peak ripple component superimposed on the D.C. If more ripple is observed,

filter capacitors C-16 and C-17 may require replacement.

Inability to deliver 5 ma into a 1000-ohm load may result from too low a power supply voltage. If this is the case, plug-in capacitor C-21 may require replacement. A voltage regulator tube with excessive dynamic impedance may result in reduced output capability in the 0.5 cps to 3 cps range. The OA2 regulator can be tested for this characteristic by applying a 100 cps amplifier input sufficient to produce 3 volts RMS output with 1000 ohms across the output terminals. A ripple voltage in excess of 500 millivolts across the OA2 as read on an averaging type VTVM indicates excessive dynamic impedance.

# MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type and Tolerance | Wattage | Function |
|---|---|---|---|---|---|
| R1-A | 200 K | Electra Mfg. Corp. | DC-1/2C Vinyl sleeve 1% | 1/2 watt | Input attenuator |
| R1-B | 100 K | " " " | " " " " | " | " " |
| R1-C | 100 K | " " " | " " " " | " | " " |
| R1-D | 160 K | " " " | " " " " | " | " " |
| R1-E | 40 K | " " " | " " " " | " | " " |
| R1-F | 180 K | Electra Mfg. Corp. | DC-1/2C Vinyl sleeve 1% | 1/2 watt | Input attenuator |
| R1-G | 20 K | " " " | " " " " | " | " " |
| R1-H | 190 K | " " " | " " " " | " | " " |
| R1-J | 10 K | " " " | " " " " | " | " " |
| R1-K | 196 K | " " " | " " " " | " | " " |
| R1-L | 4 K | Electra Mfg. Corp. | DC-1/2C Vinyl sleeve 1% | 1/2 watt | Input attenuator |
| R1-M | 200 K | " " " | " " " " | " | " " |
| R1-N | 2 K | " " " | " " " " | " | " " |
| R1-P | 200 K | " " " | " " " " | " | " " |
| R1-Q | 1 K | " " " | " " " " | " | " " |
| R1-R | 200 K | Electra Mfg. Corp. | DC-1/2C Vinyl sleeve 1% | 1/2 watt | Input attenuator |
| R1-S | 400 Ohms | " " " | " " " " | " | " " |
| R1-T | 200 K | " " " | " " " " | " | " " |
| R1-U | 200 Ohms | " " " | " " " " | " | " " |
| R1-V | 200 K | " " " | " " " " | " | " " |

# MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type and Tolerance | Wattage | Function |
|---|---|---|---|---|---|
| R-2 | 15 Meg. | Allies Products | APST-1/2 axial 10% | 1/2 watt | Grid leak V-3 |
| R-3 | 220 K | Ohmite | EB 10% | " | Plate load V-3 |
| R-4 | 20 Ohms | IRC | BOC vinyl sleeve 1% | " | Feedback divider AC Amp. |
| R-5 | 4.7 K | Ohmite | EB 10% | " | Cathode bias V-3 |
| R-6 | 2.2 Meg. | " | EB 10% | " | Plate load V-3 |
| R-7 | 8.2 Meg. | Ohmite | EB 10% | 1/2 watt | Grid leak V-3 |
| R-8 | 10 Meg. | " | EB 10% | " | Grid leak V-4 (Pentode) |
| R-9 | 680 Ohms | " | EB 10% | " | Cathode bias V-4 (Pentode) |
| R-10 | 150 K | " | EB 10% | " | Plate load V-4 (Pentode) |
| R-11 | 22 K | " | EB 10% | " | Screen bleeder V-4 (Pentode) |
| R-12 | 47 K | Ohmite | EB 10% | 1/2 watt | Screen Res. V-4 (Pentode) |
| R-13 | 2.2 Meg. | " | EB 10% | " | Crossover network |
| R-14 | 4.7 K | " | EB 10% | 2 watt | Cathode load V-4 |
| R-15 | 22 K | IRC | BOC vinyl sleeve 1% | 1/2 watt | Feed divider AC Amp. |
| R-16 | * | Ohmite | EB 10% | " | Gain adjustment AC Amp. |
| R-17 | 22 K | IRC | BOC vinyl sleeve 1% | 1/2 watt | Feedback divider DC Amp. |
| R-18 | * | Ohmite | EB 10% | " | 60 cycle beat adjustment |
| R-19 | 22 K | IRC | BOC vinyl sleeve 1% | " | Feedback divider, mod. ref. |
| R-20 | * | Ohmite | EB 10% | " | Gain adjustment DC Amp. |
| R-21 | 560 K | IRC | MBC 1% | " | Modulation resistor |

* Factory adjustment

## MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type and Tolerance | | Wattage | Function |
|---|---|---|---|---|---|---|
| R-22 | 560 K | IRC | MBC | 1% | 1/2 watt | Modulator equalizing Res. |
| R-23 | 20 Ohms | " | BOC vinyl sleeve | 1% | " | Feedback divider mod. ref. |
| R-24 | 15 Meg. | Allies Products | APST-1/2 axial | 10% | " | Grid leak V-1 |
| R-25 | 20 Ohms | IRC | BOC vinyl sleeve | 1% | " | Feedback divider DC Amp. |
| R-26 | 1.5 Meg. | Ohmite | EB | 10% | " | Plate load V-1 |
| R-27 | 6.8 Meg. | Ohmite | EB | 10% | 1/2 watt | Screen resistor V-1 |
| R-28 | 10 Meg. | " | EB | 10% | " | Grid leak V-2 (triode) |
| R-29 | 1 K | " | EB | 10% | " | Cathode bias V-2 (triode) |
| R-30 | 100 K | " | EB | 10% | " | Plate load V-2 (triode) |
| R-31 | 150 K | " | EB | 10% | " | Cathode bias bleeder V-2 (triode) |
| R-32 | 10 Meg. | Ohmite | EB | 10% | 1/2 watt | Grid leak V-2 (pentode) |
| R-33 | 820 Ohms | " | EB | 10% | " | Cathode bias V-2 (pentode) |
| R-34 | 180 K | " | EB | 10% | " | Plate load V-2 (pentode) |
| R-35 | 27 K | " | EB | 10% | " | Screen bleeder V-2 (pentode) |
| R-36 | 47 K | " | EB | 10% | " | Screen resistor V-2 (pentode) |
| R-37 | 1 Meg. | Ohmite | EB | 10% | 1/2 watt | Demodulator filter circuit |
| R-38 | 68 K | IRC | MBC | 1% | " | Demodulator current limiter |
| R-39 | * | IRC | MBC | 1% | " | Zero sig. output offset adj. |
| R-40 | 3 Ohms | Ward Leonard | 5X Axiohm | 10% | 5 watt | Filter circuit DC heater supply |
| R-41 | 82 K | Ohmite | EB | 10% | 1/2 watt | B+ decoupling V-1 & V-3 |

* Factory adjustment

# MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type and Tolerance | | Wattage | Function |
|---|---|---|---|---|---|---|
| R-42 | 15 K | Ohmite | EB | 10% | 1/2 watt | B+ decoupling V-2 triode |
| R-43 | 2.5 K | Tomore | M | 3% | 25 watt | V-6 dropping res. neg. supply |
| R-44 | 2.5 K | Tomore | M | 3% | " | B+ filter circuit |
| R-45 | 5 K | Tomore | M | 3% | " | B+ filter circuit |

# MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type and Tolerance | Working Volts | Function |
|---|---|---|---|---|---|
| C-1 | .047 mfd | Pyramid | EPGH 20% | 200 | Input capacitor AC Amp. |
| C-2 | .1 " | " | PGH 20% | 300 | Cascade grid decoupler V-3 |
| C-3 | .022 " | " | " " | 400 | " " " " |
| C-4 | 33 mmfd | El Menco | CM-15 silver mica 5% | 500 | High frequency roll off |
| C-5 | .22 mfd | Pyramid | PGH 20% | 200 | Coupling capacitor |
| C-6 | .022 mfd | Pyramid | EPGH 20% | 400 | Coupling capacitor |
| C-7 | 75 mmfd | El Menco | CM-15 silver mica 5% | 500 | Feedback freq. divider AC Amp. |
| C-8 | (2).002 mfd | El Menco | CM-20 mica 20% | 500 | Input capacitor DC Amp. |
| C-9 | .22 " | Pyramid | PGH 20% | 200 | Screen decoupling V-1 |
| C-10 | .022 " | " | " " | 400 | " " " |
| C-11 | .022 mfd | El Menco | CM20 mica 20% | 500 | Phase correction. DC Amp. |
| C-12 | .01 " | " | CM40 mica " | 300 | Coupling capacitor |
| C-13 | .01 " | " | " " " | 300 | " " |
| C-14 | .01 " | " | " " " | 300 | " " |
| C-15 | .01 " | " | " " " | 300 | Demodulator filter |
| C-16 | 1000 mfd | Cornell Dubilier | BRH-1210 Electrolytic | 12 | DC heater supply filter |
| C-17 | 1000 " | " " | " " " | 12 | " " " " |
| C-18 | 4 " | " " | BR-425 " | 250 | V-2 triode decoupling |
| C-19 | 4 " | " " | " " | 250 | V-1 and V-3 decoupling |
| C-20 | .1 " | Pyramid | PGH 20% | 300 | V-6 shunting capacitor |
| C-21ABC | 20-20-20 mfd | Cornell Dubilier | QC-22245 Electrolytic | 450 | Power supply filter capacitor |

## MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type | Function |
|---|---|---|---|---|
| L-1658 | Transformer | Colin Campbell Co. | | Power supply transformer |
| Chopper | 60-cycle converter | Brown Instrument Co. | | Modulator D. C. Amp. |
| BC-1 | Mercury cell | Mallory | RM-412 (tabs) | Grid bias for V-3 input grid |
| SW-1 | 3-deck wafer switch | Centralab | PA-2008 | Input attenuator |
| SW-2 | Toggle switch | A. H. & H. | SPST | Power switch |
| P-1 | Coaxial plug | Cannon Electric | DPB-A10C2-34P-1L (modified) | Input, output, & power plug |
| P-2 | 2-contact plug | EMR | 62A-31 | Chopper excitation plug |
| F-1 | 3AG fuse | Littlefuse | 312001 | Power fuse |
| Pilot light | 6.3V instrument light | General Electric | 328 | Power on-off indicator |

# MODEL 62A - PARTS LIST

| Symbol | Description | Manufacturer | Type |
|---|---|---|---|
| V-1 | Tube - pentode | General Electric | 6136 5 Star |
| V-2 | Tube - triode-pentode | RCA | 6U8 |
| V-3 | Tube - dual triode | General Electric | 5751 5 Star |
| V-4 | Tube - triode-pentode | RCA | 6U8 |
| V-5 | Tube - Full wave rectifier | RCA | 6X4 |
| V-6 | Tube - gas regulator | RCA | OA2 |
| D-1 | Selenium diode | International Rectifier Corp. | 3U1 |
| D-2 | Selenium diode | International Rectifier Corp. | 3U1 |
| D-3 | Germanium diode | General Electric | 1N91 |
| D-4 | " " | " " | " |
| D-5 | " " | " " | " |
| D-6 | " " | " " | " |

# MODEL 62A - PARTS LIST

| Quantity | Description | Manufacturer | Type |
|---|---|---|---|
| 1 | Pilot light assembly | Dialight Corp. | 8-1930-621 |
| 1 | Fuse holder | Littlefuse | 342003 |
| 3 | 7-pin tube sockets | Cinch | 9355 |
| 3 | 9-pin tube sockets | Cinch | 13381 |
| 1 | Octal tube socket | Cinch | 9829 |
| 1 | 6-pin tube socket | Cinch | 2156 |
| 3 | Tube shields | Cinch | 13376 |
| 2 | Tube shields | Cinch | 8698-1 |
| 1 | Tube shield | Cinch | 8691-1 |
| 3 | Neoprene shock mounts | Barrymount | 275-1 |
| 2 | Mounting fasteners | Simmons | W-2 |
| 13 | Insulated terminals | U.S. Engineering Co. | F-1417 |
| 1 | Input attenuator knob | EMR | 62A-36 |

## MODEL 62A

## TUBE SOCKET D. C. VOLTAGES

| Pin No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| V-1 | -.64 | * | 5.6 | Gnd. | 70 | 22 | * | | |
| V-2 | 52 | 0 | 48 | Htr. | Htr. | 48 | 2.0 | 1.6 | 0 |
| V-3 | 88 | 1.3 | * | 5.6 | 5.6 | 110 | 84 | 88 | Gnd. |
| V-4 | 200 | 0 | 43 | Htr. | Htr. | 46 | 1.8 | * | -3.6** |
| V-5 | | | | | | | 360 | | |
| V-6 | 150 | | | | 150 | | Gnd. | | |

* Varies with applied signal
**With 0 signal applied

### D. C. Voltages at Other Selected Points

1. Common junction of the four filament diodes = 7.4V.
2. Opposite end of filament dropping resistor from the diodes = 5.6V.
3. Pin #5 of P-1 = 200V.
4. Plate supply for first half of V-4 and second half of V-2 = 150V.
5. Plate supply for first half of V-2 = 125V.
6. Plate supply for V-3 and V-1 = 130V.
7. Negative power supply voltage = -54V.

| No. | Date | Revised by |
|---|---|---|
| A | 6-9-54 | POSITION NO'S ADDED ON SW-1, R-39 TO BE ADJUSTED AT R-4, C-8 VALUES CHANGED, |
| B | 6-14-54 | DYNO'S. ADDED, ZI NOT SI, NO |
| C | 11-11-54 | R-7, C-1, C-5 VALUES CHANGED, R-9 RETURNED TO PIN 8 |
| D | 2-4-55 | DELETED 8C-1 (WAS 0.1 UF) WAS .047 UF (F.P.) |
| E | 2-9-55 | C-6 WAS .022, R-1 WAS 2.2 MEG. |
| F | 6-15-55 | R-15, 17, 19 WERE 22K |

R-26 1.5 MEG. R-27 6.8 MEG. C-10 .022 uf R-30 100K R-31 150K 6U8 V-2 R-34 180K R-36 47K C-14 .01 uf R-37 1MEG. 6136 V-1 R-21 560K 1% C-8 .004 uf C-12 .01 uf C-13 .01 uf R-22 560K 1% R-24 15MEG. CHOPPER C-9 .22 uf C-11 2000 uf R-25 20Ω 1% R-28 10MEG. R-29 1K R-32 10 MEG. R-33 820Ω R-35 27K C-15 .01 uf

P-2 01 20

R-23 20Ω 1%

TERM. #7 OF L-1658

D-1 3U1 R-38 6.9K 1% DOT NOTATION TO BE OBSERVED D-2 3U1 R-39 *47K APPROX. 28V 6V IN91 D-3 IN91 D-4 IN91 D-5 IN91 D-6 L-1658 V-4 V-5 V-2 R-40 3Ω 5W C-16 1000 uf V-3 4+5 V-1 3 C-17 1000 uf PILOT LIGHT

1 AMP. SW-2 F-1 PIN #2 OF P-1 115 V AC 60~ PIN #1 OF P-1

R-42 15K R-41 82K R-44 2500Ω 25W R-45 5K 25W 6X4 V-5 320 TOP P-1

PIN #5 OF P-1

OA2 V-6 C-18 4uf C-19 4uf C-20 .1uf C-21A 20uf C-21B 20uf C-21C 20uf

R-43 2500Ω 25W R-14 4.7K 2W

PIN #6 OF P-1 INPUT SLEEVE OF PIN #6 P-1 SW-1 C-1 0.0047 MFD R-1A 200K R-1B 100K R-1C 100K R-1D 160K R-1E 40K R-1F 180K R-1G 20K R-1H 190K R-1J 10K R-1K 196K R-1L 4K R-1M 200K R-1N 2K R-1P 200K R-1Q 1K R-1R 200K R-1S 400Ω R-1T 200K R-1U 200Ω R-1V 200K

ALL R-1 SERIES ±1%

R-3 220K R-6 2.2 MEG. C-3 .022 uf R-10 150K R-12 47K R-13 2.2 MEG. C-5 0.1uf C-6 0.01uf MICA 5751 V-3 6U8 V-4 R-2 15 MEG. R-5 4.7K R-7 8.2 MEG. C-2 .1uf C-4 33 uuf R-11 22K R-17 20.7K 1% R-18 * R-19 20.7K 1% R-20 * R-15 20.7K 1% C-7 7.5 uuf R-16 * R-8 10MEG. R-9 680Ω R-4 20Ω 1%

SLEEVE OF PIN 14 P-1 1 7 8 14 3 9 10

1 } 115 VAC 60W POWER
2 }
3 JUMPER TO PIN 5 AT MATING PLUG
4 AMP. OUTPUT - SLEEVE GND.
5 JUMPER TO PIN 3 AT MATING PLUG
6 AMP. INPUT - SLEEVE - SHIELD
7 GROUND
8 } JUMPERED AT MATING PLUG
9 }
10 }

* ADJUSTED AT FACTORY
ALL RESISTORS ½ WATT ±10% UNLESS NOTED

**Electro-Mechanical Research, Inc.**
RIDGEFIELD CONNECTICUT

SCHEMATIC DIAGRAM
MODEL 62A
D.C. AMPLIFIER

DATE: 5-4-54 DRAWN: HC
SCALE: ~ APP: RAP
62A-E1

(A)(B)(C)(D)(E)(F)

C-00698